



Project Summary

A Subtitle D Landfill Application Manual for the Multimedia Exposure Assessment Model (MULTIMED)

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The MULTIMED computer model simulates the transport and transformation of contaminants released from a hazardous waste disposal facility into the multimedia environment. This report is an application manual for the use of MULTIMED in modeling Subtitle D land disposal facilities (as described in the Resource Conservation and Recovery Act). For Subtitle D facilities, only the flow and transport components of MULTIMED are used in simulating leachate movement through the unsaturated zone and transport in the saturated zone. A preprocessor guides the user in the creation of a correct Subtitle D input file by restricting certain options and parameters and by setting appropriate defaults. Instruction is provided for inexperienced as well as experienced model users who seek to study or design waste disposal facilities.

This Project Summary was developed by EPA's Environmental Research Laboratory, Athens, GA, to announce key findings of the research that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Overview

The Multimedia Exposure Assessment Model (MULTIMED) simulates the movement of contaminants leaching from a waste disposal facility. The model includes two options for simulating leachate flux. Either the infiltration rate to the unsaturated or saturated zone can be specified directly or a landfill module can be used to estimate the infiltration rate. The landfill module is one-dimensional and steady-state, and simulates the effect of precipitation, runoff, infiltration, evapo-

transpiration, barrier layers (which can include flexible membrane liners), and lateral drainage.

To enhance the user-friendly nature of the model, separate interactive preprocessing and postprocessing software have been developed for use in creating and editing input and in plotting model output. The pre- and postprocessors, PREMED and POSTMED, have not been integrated with MULTIMED because of the size limitations of personal computers. Therefore, after using the preprocessor to create or modify input, the model is run in batch mode. Afterwards, the postprocessor can be used to produce plots of the Monte Carlo output or plots of concentration versus time for transient output.

Subtitle D Applications

Some restrictions apply in the application of MULTIMED to Subtitle D facilities. These restrictions were made in an effort to develop a conservative approach for simulating leachate migration. First, only saturated and unsaturated modules may be used. Second, only steady-state or transport simulations are allowed. Third, no decay of the source term is allowed; the concentration of contaminants entering the aquifer system must be constant in time. Fourth, the receptor must be located directly downgradient from the facility so that it intercepts the center of the contaminant plume. Fifth, the contaminant concentration must be calculated at the top of the aquifer.

Thus, MULTIMED can be applied at many Subtitle D land disposal facility sites to simulate the transport of contaminants from the source, through the saturated and unsaturated zones, to a receptor well. When MULTIMED is used in conjunction with a separate source model, such as



HELP, it can be used in a variety of applications. These applications include (1) development and comparison of the effects of different facility designs on groundwater quality, (2) prediction of the results of different types of "failure" of the landfill, and (3) prediction of the fate of the contaminants in the subsurface if leachate migration into the groundwater below an existing waste disposal facility occurs. MULTIMED is not appropriate for all sites, however. Care should be taken to assure that the model is used appropriately.

MULTIMED can be used in the design process to demonstrate that a particular configuration will adequately prevent contaminant concentrations in groundwater from exceeding health-based thresholds. In other words, MULTIMED combined with a source model can be used to demonstrate that either a landfill design or the specific hydrogeologic conditions present at a site will prevent the migration of significant quantities from the landfill.

In applying MULTIMED at a Subtitle D Facility, the user must (1) collect site-specific hydrogeologic data, (2) determine the contaminant to be simulated and the active modules in MULTIMED and the point of compliance, (3) propose a landfill design and determine the corresponding infiltration rate, (4) run MULTIMED and calculate the dilution attenuation factor, and (5) determine whether the design is acceptable based on the resulting dilution attenuation factor.

This application manual for the MULTIMED model and pre- and postprocessors, PREMED and POSTMED, is designed to be used by inexperienced as well as experienced users. Instructions are suggested for two types of inexperienced users—the "hands-on, learn-as-you-go" user and the "read the document first" user. An experienced user is defined as one who is already familiar with the basic capabilities and operational aspects of

PREMED, MULTIMED, and POSTMED, and wants to use the programs to perform simulations.

Obtaining MULTIMED Software

The MULTIMED computer code may be obtained by sending a request to Model Distribution Coordinator, Center for Exposure Assessment Modeling, Environmental Research Laboratory, U.S. Environmental Protection Agency, Athens GA 30605-2720. Please include either five 5.25-in (double-sided, double density, DS/DD 360KB) diskettes or two 3.5-in (double-sided, high-density, DS/HD 1.44MB, error free) diskettes. The MULTIMED code will be copied to your diskettes and returned to you. Model documentation is also available by sending two 3.5-in diskettes (DS/HD). A hard copy of the documentation is available from the National Technical Information Service (see box below).

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The complete report, entitled "A Subtitle D Landfill Application Manual for the Multimedia Exposure Assessment Model (MULTIMED)," (Order No. PB93-185536; Cost: \$36.50), will be available only from:

*National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650*

*The EPA Project Officer can be contacted at:
Environmental Research Laboratory
U.S. Environmental Protection Agency
Athens, GA 30605-2720*

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